



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/720,579	11/24/2003	Sangyum Kim	1772-5	5710
24106	7590	01/03/2008		
EGBERT LAW OFFICES 412 MAIN STREET, 7TH FLOOR HOUSTON, TX 77002			EXAMINER WONG, EDNA	
			ART UNIT 1795	PAPER NUMBER
			MAIL DATE 01/03/2008	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/720,579	KIM ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Edna Wong	1795	

**– The MAILING DATE of this communication appears on the cover sheet with the correspondence address –**  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 10 December 2007.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 16-22 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 16-22 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

Art Unit: 1795

This is in response to the Amendment dated December 10, 2007. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office Action.

### ***Response to Arguments***

#### **Specification**

The disclosure has been objected to because of minor informalities.

The objection of the disclosure has been withdrawn in view of Applicants' amendment.

#### **Claim Objections**

Claims **1 and 7** have been objected to because of minor informalities.

The objection of claims 1 and 7 has been withdrawn in view of Applicants' amendment.

#### **Claim Rejections - 35 USC § 112**

Claims **1-11** have been rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The rejection of claims 1-11 under 35 U.S.C. 112, second paragraph, has been withdrawn in view of Applicants' amendment.

Claim Rejections - 35 USC § 103

Claims 1-11 have been rejected under 35 U.S.C. 103(a) as being unpatentable over **Wolski et al.** (US Patent No. 5,834,140) in combination with **Yates et al.** (US Patent No. 5,863,410) and **Merchant et al.** (US Patent No. 5,863,666).

The rejection of claims 1-11 under 35 U.S.C. 103(a) as being unpatentable over Wolski et al. in combination with Yates et al. and Merchant et al. has been withdrawn in view of Applicants' amendment. Claims 1-11 have been cancelled.

***Response to Amendment***

***Claim Objections***

Claim 20 is objected to because of the following informalities:

Claim 20

line 1, the word -- in -- should be inserted after the word "being".

line 2, the word -- and -- should be inserted after the value "150 g/l,".

line 2, the words -- being in an amount -- should be inserted after the value "150 g/l,".

Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

Claim **22** is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 22

lines 1-2, recite "said electrolyte has a current density of between 20 and 150 A/dm<sup>2</sup>."

It is unclear how the electrolyte has a current density. Should the current density of between 20 and 150 A/dm<sup>2</sup> be further limiting the negative current and/or positive current recited in claim 16, line 9?

***Claim Rejections - 35 USC § 103***

Claims **16-22** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Wolski et al.** (US Patent No. 5,834,140) in combination with **Yates et al.** (US Patent No. 5,863,410) and **Merchant et al.** (US Patent No. 5,863,666).

Wolski teaches a method for manufacturing an electrodeposited copper foil comprising:

(a) forming an electrolyte solution **3** (= electrolyte) [col. 3, line 3] containing a sulfuric acid (col. 6, lines 53-56; and col. 8, lines 45-47) and a copper ion (= from copper sulfate) [col. 6, lines 53-56; and col. 8, lines 45-47] and a chloride ion (col. 6, lines 14-29);

(b) adding an additive to said electrolyte solution, said additive consisting of 6 ppm to 10 ppm of gelatin (= 0.3 to 35 ppm by weight of gelatin) [col. 5, lines 42-54; col. 6, lines 10-11; and col. 12, lines 41-43] and 5 ppm to 50 ppm of hydroxyethyl cellulose (= 0.1 to 15 ppm of hydroxyethyl cellulose) [col. 5, lines 18-30; col. 6, lines 9-10; and col. 8, line 50];

(c) submerging a rotating drum 2 (= a drum-shaped cathode) and an anode plate 1 in said electrolyte solution 3, said anode plate having a curved shaped and spaced by a distance from an outer surface of the drum (= provided to a concentric circle shape to said cathode 2) [col. 3, lines 3-13; and Fig. 1]; and

(d) applying a negative current (= cathode) to said drum 2 and a positive current (= anode) to said anode plate 1 so to deposit the copper foil 4 onto said outer surface of said drum (= to deposit copper on the surface of said cathode) [col. 3, lines 9-13].

The deposited copper foil has a matte side and a shiny side (col. 3, lines 55-58).

The sulfuric acid is in an amount of 50 to 200 g/l (= 110 g/l of sulfuric acid) and said copper ion is in an amount of 30 to 150 g/l (= 90 g/l of copper) [col. 8, lines 45-48].

The electrolyte solution is at a temperature of between 20 and 80°C (= 58°C) [col. 8, Table 1, "Temperature"].

The electrolyte has a current density of between 20 and 150 A/dm<sup>2</sup> (= 50 A/dm<sup>2</sup>) [col. 8, Table 1, "Current density"].

The method of Wolski differs from the instant invention because Wolski does not disclose the following:

- a.     Wherein the additive consists of 0.05 ppm to 20 ppm of bis(sodiumsulfopropyl)disulfide, as recited in claim 16.
- b.     Wherein said bis(sodiumsulfopropyl)disulfide is an amount of between 0.5 ppm to 3 ppm, as recited in claim 17.

Wolski teaches that adding 3-mercapto-1-propanesulfonate ( $\text{HS}(\text{CH}_2)_3\text{SO}_3\text{R}$ ) in combination of the high molecular weight polysaccharide and/or the low molecular weight glue and a minute amount of the chloride ion to the electrolyte, various characteristics required for a low-profile copper foil for fine patterning can be realized at a high level (col. 6, lines 30-35).

Like Wolski, Yates teaches an electrolytic process for producing copper foil having a low profile surface (col. 1, lines 7-11). Yates teaches that water soluble, sulfonated organic sulfur compounds are important addition agents. Many simple bivalent sulfur organic compounds possess similar ability and thus be useful as additions agents in the electrodeposition of copper. These substances can belong to the group of aliphatic thiols,  $R\text{-SH}$ , sulfides,  $R^1\text{-S-R}^2$ , disulfides  $R^1\text{-S-S-R}^2$ , as well as aromatic and heterocyclic thiols, sulfides and disulfides (col. 10, line 55 to col. 11, line 2).

Like Yates, Merchant teaches an electrolytic process for producing copper foil (col. 3, lines 59-62). Merchant teaches that it is critical that the concentration of organic

additives in the electrolyte solution be at least about 0.3 ppm. The organic additive can be selected from the group consisting of saccharin,... sulfopropyl disulfide, ... (col. 4, line 64 to col. 5, line 15).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the additive described by Wolski with wherein the additive consists of 0.05 ppm to 20 ppm of bis(sodiumsulfopropyl)disulfide; and wherein said bis(sodiumsulfopropyl)disulfide is an amount of between 0.5 ppm to 3 ppm because a disulfide would have been a functionally equivalent addition agent to the sulfonated organic sulfur compounds as taught by Yates (col. 10, line 55 to col. 11, line 2), and a sulfopropyl disulfide would have been an obvious disulfide to use in an electrolytic process for producing copper foil as taught by Merchant (col. 4, line 64 to col. 5, line 15), and a bis(sodiumsulfopropyl)disulfide would have been an obvious sulfopropyl disulfide to use in an electrolytic process for producing copper foil because structural relationships may provide the requisite motivation or suggestion to modify known compounds to obtain new compounds.

c. Wherein said matte side has a roughness greater than a roughness of said shiny side, as recited in claim 18.

Wolski teaches that the untreated copper foil, the so-called shiny side which is a surface at the side of contacting with the drum has a relatively smooth surface, but at the reverse surface called a matte side, unevenness is relatively remarkable (col. 3,



lines 55-58). The surface roughness of the untreated copper foil is almost determined by the electrolysis conditions when copper is deposited on the drum-shaped cathode, particularly by an additive to be added to an electrolyte (col. 3, lines 50-54).

The invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because the so-called shiny side which is a surface at the side of contacting with the drum would have had a relatively smooth surface, but at the reverse surface called a matte side, unevenness would have been relatively remarkable as taught by Wolski (col. 3, lines 55-58).

d.      Wherein said gelatin has a molecular weight of greater than 10000, as recited in claim 19.

Wolski teaches that the commercially available products have weight average molecular weights (Mw) of 10,000 or less (col. 5, lines 42-54).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the molecular weight of the gelatin described by Wolski with wherein a molecular weight of the gelatin is above 10000 because a *prima facie* case of obviousness exists where claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties (MPEP § 2144.05(I)).

For example, a Mw of 10,000 versus a Mw of 10,001.

e.      Wherein said chloride ion is in an amount of 200 mg/l, as recited in claim 20.

Wolski teaches that in order to produce a low-profiled copper foil in a broad current density range stably, it is preferred to keep the amount in a range of 10 to 60 ppm. Even when the amount exceeds 60 ppm, low profiling can be effected (col. 6, lines 14-29).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the chloride ion described by Wolski with wherein said chloride ion is in an amount of 200 mg/l because when the amount exceeds 60 ppm, low profiling would have still been effected as taught by Wolski (col. 6, lines 14-29).

Furthermore, the concentration of chloride ions is a result-effective variable and one skilled in the art has the skill to calculate the concentration that would have determined the success of the desired reaction to occur, e.g., to produce a low-profiled copper foil in a broad current density range stably (MPEP § 2141.03 and § 2144.05(II)(B)).

**RE: REMARKS**

Applicants state that this additive is added to the electrolyte solution and contains between 6ppm to 100ppm of a gelatin, 5ppm to 50ppm of hydroxyethyl cellulose, and 0.05ppm to 20ppm of bis(sodiumsulfopropyl)disulfide. Applicant respectfully contends

that none of the prior art references, individually, or in combination, recite an additive that is added to the electrolyte solution in which the additive has this composition.

In response, the Examiner maintains that an additive that is added to the electrolyte solution has such a composition:

Wolski teaches **6ppm to 100ppm** of a gelatin. Wolski teaches an amount of the low molecular weight glue of **0.3 to 35 ppm** by weight (col. 6, lines 10-11; and col. 12, lines 41-43). Since Wolski teaches using gelatin as an alternative to the glue (col. 5, lines 43-47), one having ordinary skill in the art would have been expected to use 0.3 to 35 ppm by weight of the gelatin.

Wolski teaches **5ppm to 50ppm** of hydroxyethyl cellulose. Wolski teaches an amount of the high molecular weight polysaccharide of **0.1 to 15 ppm** (col. 6, lines 9-10; and col. 12, lines 37-41). Since Wolski teaches using hydroxyethyl cellulose (col. 8, line 50), one having ordinary skill in the art would have been expected to use of 0.1 to 15 ppm of hydroxyethyl cellulose.

Yates and Merchant teach **0.05ppm to 20ppm** of bis(sodiumsulfopropyl)disulfide. Merchant specifically teaches **at least about 0.3 ppm** of sulfopropyl disulfide (col. 4, line 64 to col. 5, line 15).

Applicant state that although the Yates patent does disclose the use of the sulfopropyl disulfide component, the Yates patent lacks the gelatin and the hydroxyethyl cellulose.

In response, Yates teaches using gelatin and hydroxyethyl cellulose (HEC).

Yates teaches that hydroxyethyl cellulose, compared for purpose of and example, with gelatin, is instrumental in producing micro-topography of the matte side of the foil with a very low peak-count, while reducing peaks height [col. 10, lines 13-22; and col. 11, lines 23-31].

Applicants state that as such, without this additive, the prior art combination would fail to achieve the advantages of the present invention.

Applicants also state that none of the prior art references discloses such a composition nor do they disclose the effect of lowering the roughness of the electrodeposited copper foil. As such, the prior art combination fails to achieve the advantages of the present invention.

In response, the reason or motivation to modify the reference may often suggest what the inventor has done, but for a different purpose or to solve a different problem. It is not necessary that the prior art suggest the combination to achieve the same advantage or result discovered by the Applicants. *In re Linter* 458 F.2d 1013, 173 USPQ 560 (CCPA 1972); *In re Dillon* 919 F.2d 688, 16 USPQ2d 1897 (Fed. Cir. 1990), *cert. denied*, 500 US 904 (1991); and MPEP § 2144.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

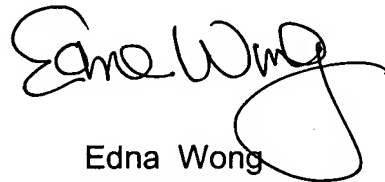
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Edna Wong whose telephone number is (571) 272-1349. The examiner can normally be reached on Mon-Fri 7:30 am to 4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

Art Unit: 1795

For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

A handwritten signature in black ink, appearing to read "Edna Wong", with a large, stylized loop at the end of the last name.

Edna Wong  
Primary Examiner  
Art Unit 1795

EW  
December 27, 2007